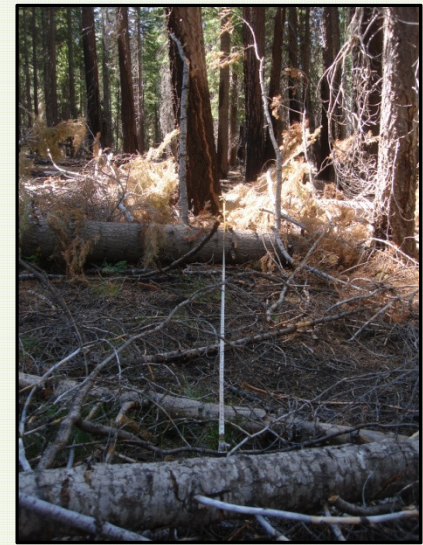


# U.S. Forest Service, Pacific Southwest Fuel Treatment Effectiveness Monitoring 2001 - 2012



## ***The Effectiveness and Longevity of Fuel Treatments in Coniferous Forests Across California***

Erin Noonan-Wright  
Nicole Vaillant  
Alicia Reiner  
Scott Dailey  
Carol Ewell



A photograph of a forest with tall, thin trees and a ground covered in brown pine needles or leaves. The image is slightly blurred and has a textured, halftone-like appearance.

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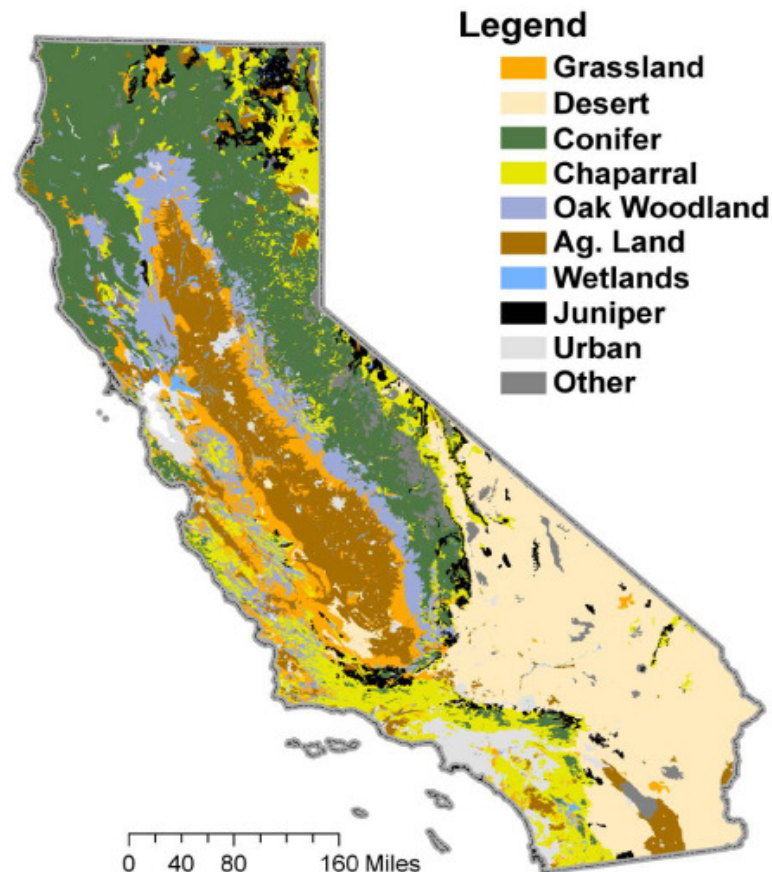
## Objectives

- Provide the context and background of a regional-scale monitoring project
- Discuss methods used to derive data and develop fire behavior outputs to evaluate fuel treatment effectiveness
- Evaluate the results of the analysis
  - How do fuels and predicted fire behavior change through time after a mechanical or prescribed fire treatment?



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## California



### Mountain Ranges

- Sierra Nevada
- Coastal
- Transverse
- Cascade
- Klamath

Elevation Range: 200 to 2,600 m.

Slope Range: 0 to 55%.

Climate: Mediterranean, characterized by temperate rainy winters and hot dry summers.

### Coniferous Tree Species

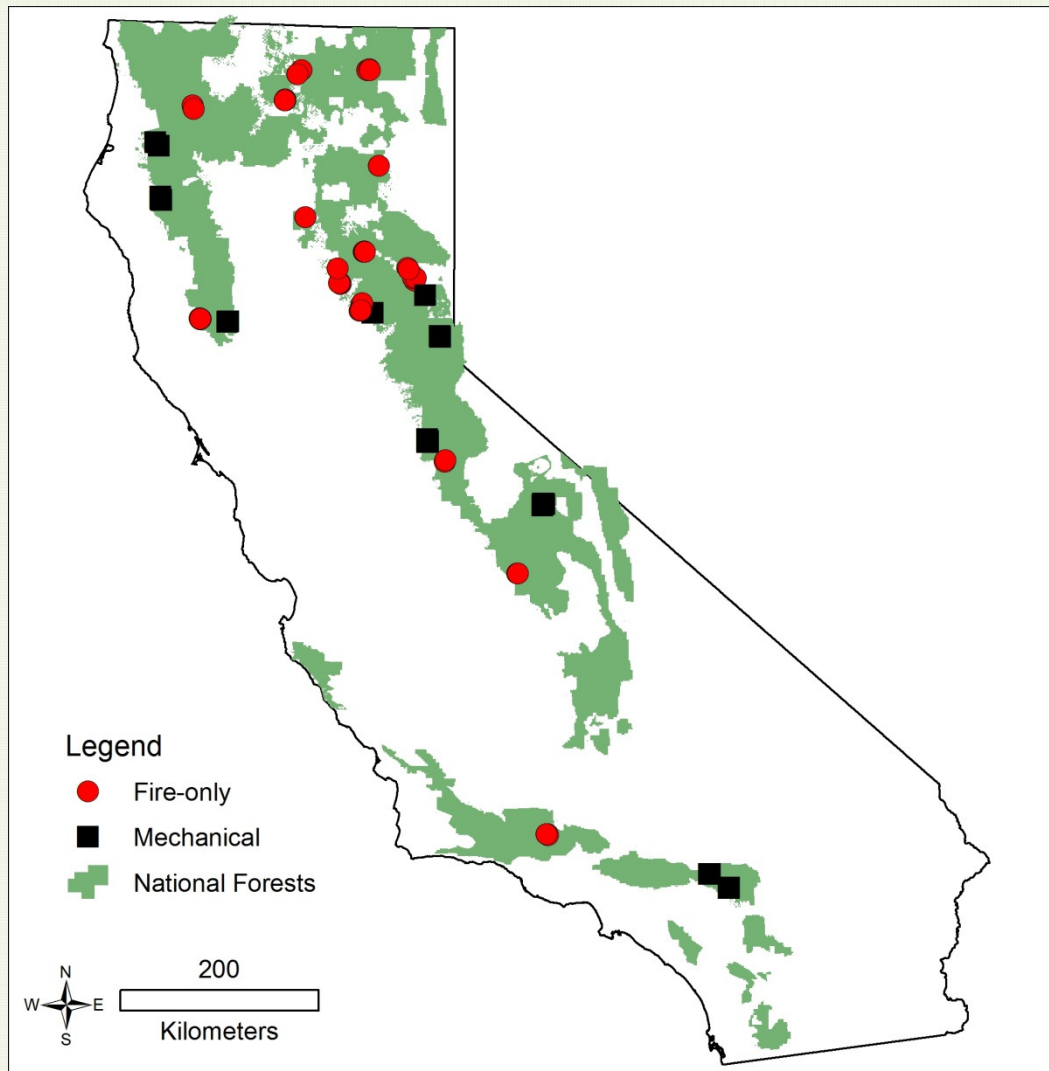
- True fir (*Abies spp.*) white, red fir
- Incense cedar (*Calocedrus decurrens*)
- Western juniper (*Juniperus occidentalis*)
- Pine (*Pinus spp.*) : ponderosa, Jeffrey, Coulter, lodgepole, sugar, western white
- Douglas-fir (*Pseudotsuga menziesii*)

### Hardwood Tree Species

- Oak (*Quercus spp.*) Black oak, canyon live oak, tan oak, Oregon white oak
- Big leaf maple, willow, Pacific dogwood



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- 14 National Forests
- 28 fuel treatment sites
- 88 plots sampled at multiple time periods:

P00: 1 year before treatment  
P01: 1 year post-treatment  
P02: 2 years post-treatment  
P05: 5 years post-treatment  
P08: 8 years post-treatment  
P10: 10 years post-treatment

-- 47 Prescribed Fire Plots  
-- 41 Mechanical Plots



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## Methods

- Original methodology based upon National Park Service Monitoring Handbook
- Random plot location within treatment
- 3-6 plots depending on year
- 2 types of plots – detailed & fuels
  - Detailed includes tree sampling
  - Fuels only
- Live & dead fuel loading





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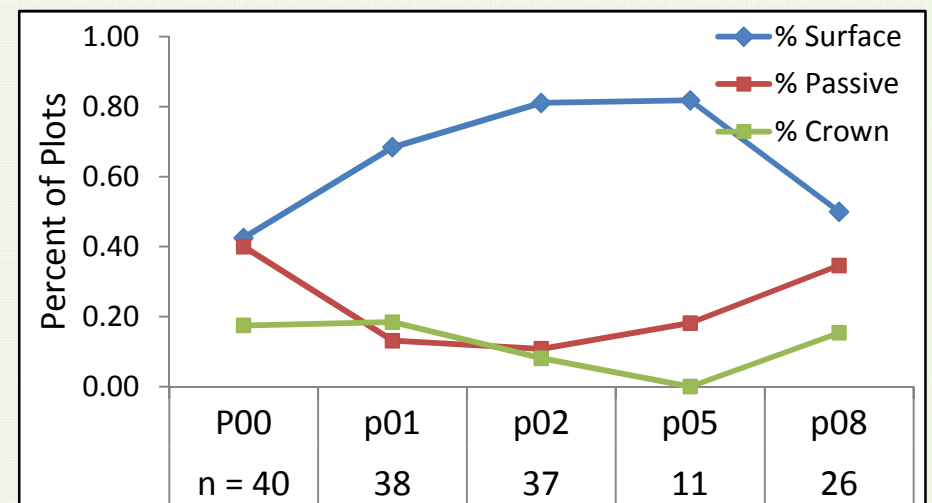
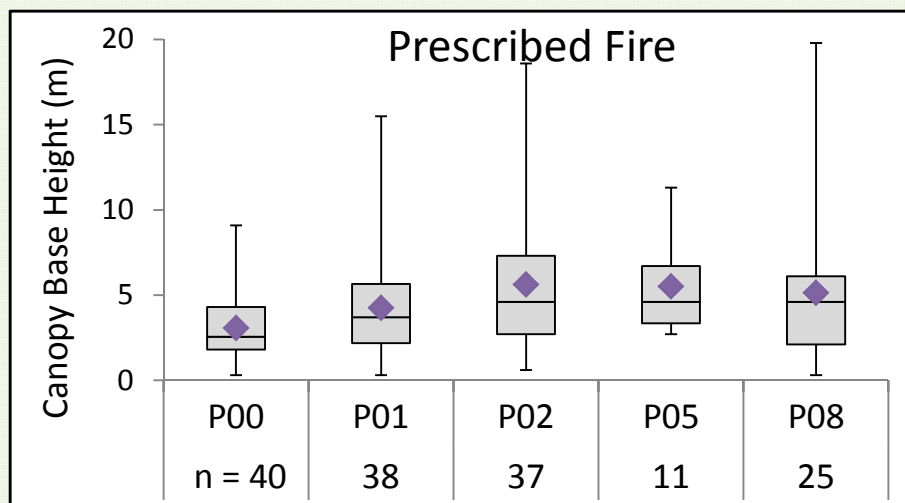
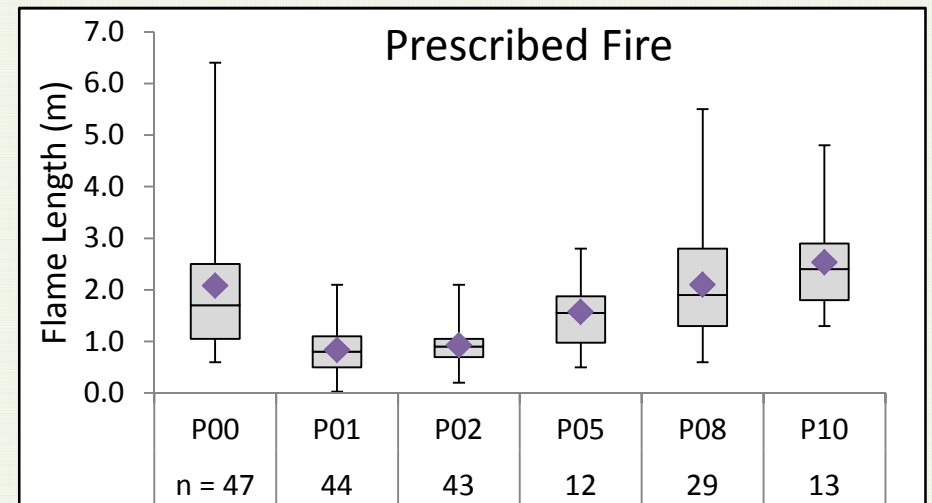
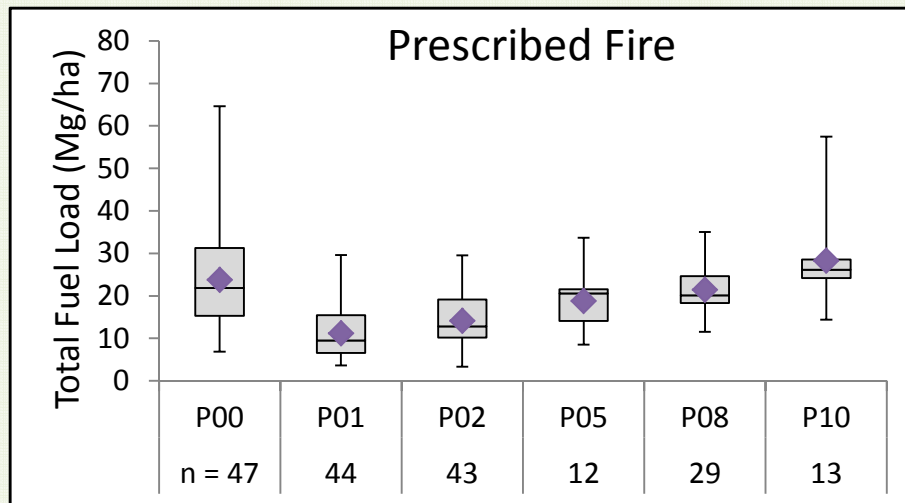
## Methods

- Biomass calculated using california constants (van Wagtendonk et al. 1996, 1998).
- FFE-FVS (fuels simulator) for canopy calculated metrics (CBD, CBH, CH)
- FFE-FVS custom fuel modeling approach
- Candidate RAWS (weather stations) used to determine 90<sup>th</sup> percentile (based on fire season) fuel moisture and wind gust speed
- Surface fire modeled using Nexus
- Crown fire modeled using Nexus

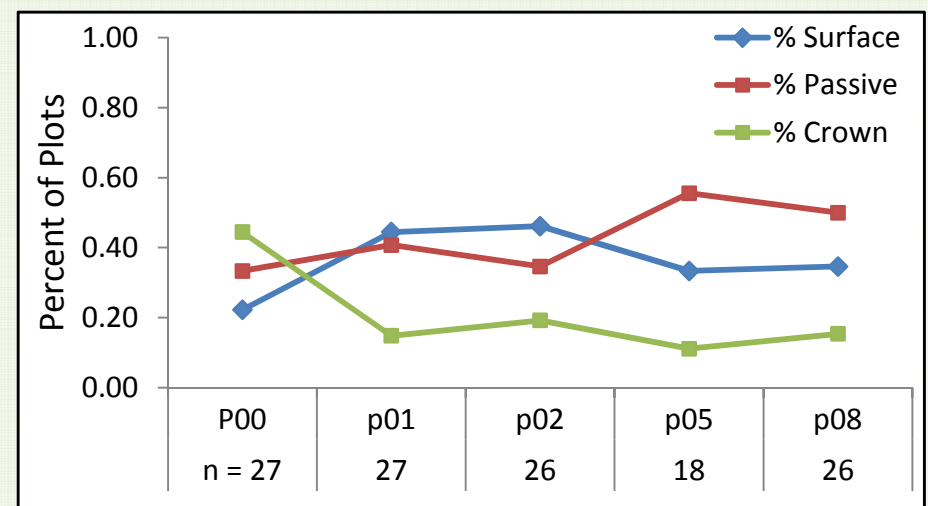
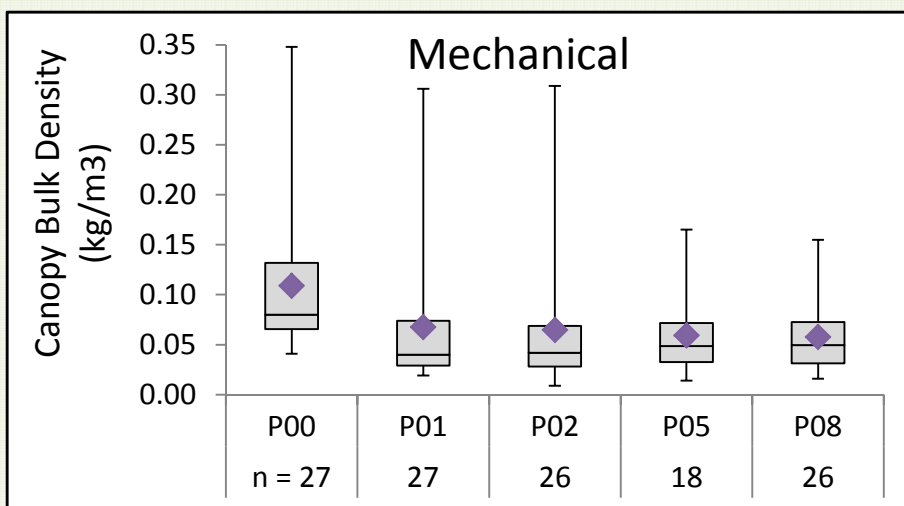
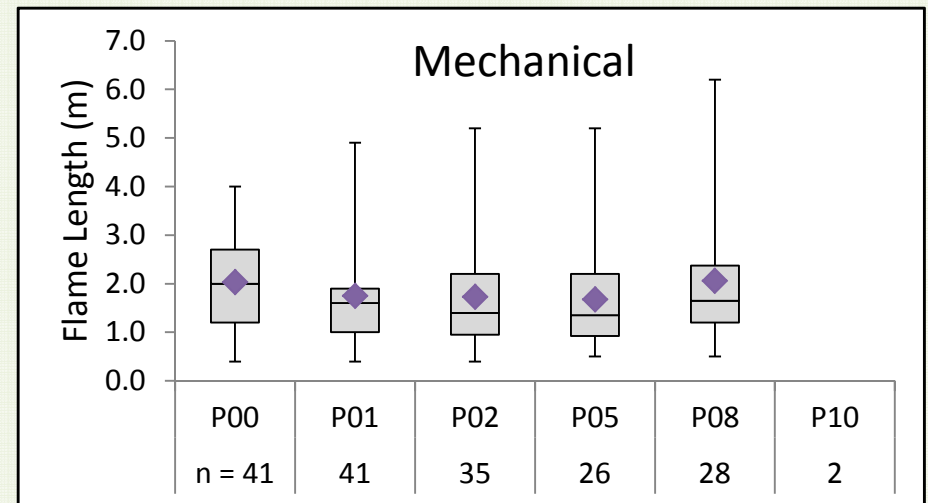
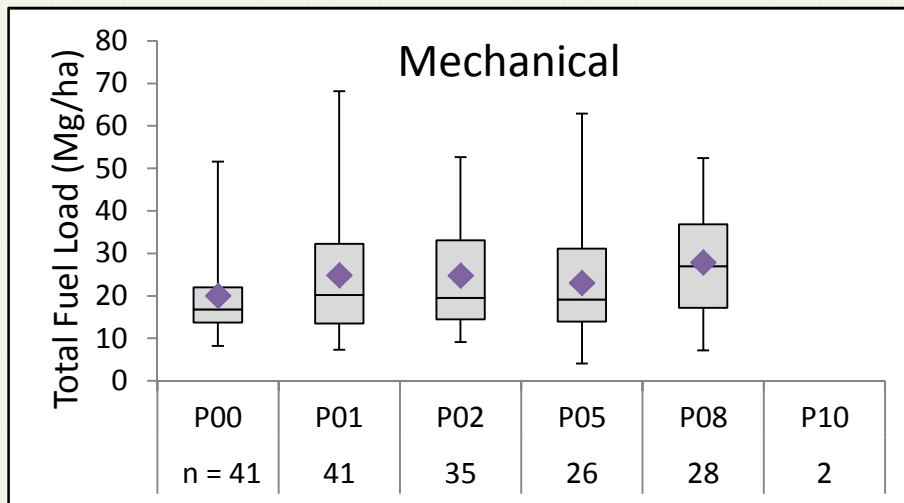




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A photograph of a forest with tall trees and a forest floor covered in brown leaves and pine needles.

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## *Prescribed Fire*

## **Conclusions**

### FUELS:

- Fuels sharply decline 1 year after treatment, and start to increase between 5-8 years after treatment, but do not match pre-treatment levels until 10 years.

### SURFACE FIRE:

- Initial decrease in surface flame lengths
- Increase in *surface* flame lengths starting around 5 years after treatment
- Surface flame lengths match pre-treatment flame lengths by 8 years post-treatment.

### CROWN FIRE:

- Initial decrease in PASSIVE crown fire until 5-8 years, when the proportion of passive and active crown fire start to increase, but not to pre-treatment levels.



A background image of a forest with tall trees and a forest floor covered in brown leaves and pine needles.

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## *Mechanical*

## **Conclusions**

### FUELS:

- Fuels data show slight increase by 1 year after treatment, likely reflecting the range of mechanical fuel treatments and continues to slowly increase over time, but results are variable.

### SURFACE FIRE:

- *Surface* flame lengths slightly decrease 1 year after treatment and don't exceed pre-treatment flame lengths until 8 years after treatment, but results are variable.

### CROWN FIRE:

- Decrease of crown fire 1 year after treatment with a continued trend of less active crown fire after 8 years post treatment.



A photograph of a forest with tall, thin trees and a ground covered in brown leaves and pine needles.

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## Acknowledgements

- Joint Fire Science JFSP-09-1-01-1
- Region 5 Fire and Aviation Management (FAM)
- Dr. JoAnn Fites-Kaufman: Initiated the project and obtained the funding for the first 6 years
- Forest fuels, fire, GIS, silviculture staff

Field Crews, Support, Analysts: Kevin McCrummen, Crystal Kolden, Katie Hetts, Morgan Pence, Lauren Miller, Tiffany Newman, Holly Hyde, Dawn Koerber, Tiffany Norman, Dave Weixelman, Marian Kadota, Wendy Boes, Joe Larson, Todd Decker